Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

ESR as a probe of spinon excitations of the spin-1/2 antiferromagnet Cs_2CuCl_4 K. POVAROV, A. SMIRNOV, Kapitza Institute for Physical Problems RAS, O. STARYKH, University of Utah, S. PETROV, Kapitza Institute for Physical Problems RAS, A. SHAPIRO, Shubnikov Institute for Crystallography RAS — We report dramatic manifestation of the uniform Dzyaloshinskii-Moriya (DM) interaction in the ESR response of quasi-one-dimensional spin-1/2 antiferromagnet Cs_2CuCl_4. We find the ESR response in the range 10-90 GHz to be strongly sensitive to the relative orientation of the magnetic field and DM axes. Most importantly, we observe splitting of the ESR line into two lines in the paramagnetic phase, upon lowering the temperature from 10 K to 1.3 K. The latter temperature is about twice the ordering temperature $T_N = 0.62$ K, and yet far below the Curie-Weiss temperature 4 K . The splitting occurs when the static magnetic field H is aligned with one of the DM axes of the material and is absent when H is oriented perpendicular to the axes. This novel phenomenon is a consequence of the critical nature of fractionalized spinon excitations of the individual antiferromagnetic chains in the paramagnetic phase. A uniform (along the spin chain direction) DM interaction provides an effective magnetic field, the sign of which is opposite for the right- and left-moving spinons. In the presence of external magnetic field this difference translates into a pair of ESR frequencies, making the experiment a novel probe of spinon excitations.

Oleg Starykh
University of Utah

Date submitted: 19 Nov 2010 Electronic form version 1.4